

REMARKS

Claims 1-14 are rejected under 35 U.S.C. §102(b) as being anticipated by or, in the alternative, under 35 U.S.C. §103(a) as obvious over JP 11-021,197.

Prior Art Rejections

The Office Action includes the following prior art rejections:

(1) Claims 1-14 under 35 U.S.C. §102(b) as anticipated by JP 11-021,197 or under 35 U.S.C. §103(a) as obvious in view of JP '197;

(2) Claims 1, 3, 5 and 10 under 35 U.S.C. §103(a) as obvious over Li et al. (U.S. Patent Publication No. 2004/0099205) in view of Applicants' disclosure and JP 2000-272,990;

(3) Claims 1, 4, 5 and 11 under 35 U.S.C. §103(a) as obvious over Sakuma et al. (U.S. Patent No. 6,332,922), or Garibin et al. (U.S. Patent No. 6,673,150), in view of Applicants' disclosure and JP '990; and

(4) Claims 1-14 under 35 U.S.C. §103(a) as obvious over Li et al. in view of JP '990 and JP '197.

Applicants respectfully traverse these rejections for the following reasons. Claim 1 is directed to a crystal grown in a single crystal pulling method in an "as-grown" condition without annealing. The prior art rejections are all based on a basic assertion by the Examiner that the properties of the claimed crystal (dimensions and light transmittance) are inherently present in crystals produced by similar methods. However, the Declaration Under 37 C.F.R. 1.132 submitted herewith clearly shows that a crystal produced by the single crystal pulling method of JP '197 does not inherently exhibit those properties, whether or not annealed. The Declaration also clearly shows that the Bridgman-Stockburger (BS) method of crucible depression (per Li or Garibin) does not result in the claimed crystal, despite additional measures of smoothing the crucible (per JP '990) or annealing (per Sakuma).

The rejections are addressed in turn hereinafter.

(1) JP 11-021197.

The Office Action of March 21, 2007 rejects claims 1-14 as being anticipated by JP 11-021197. The Examiner contends that claims 1-14 constitute product-by-process

claims to a known product and that the product of the JP '197 process and the claimed product are the same. The Examiner asserts that the "as-grown" crystal product of JP '197 would inherently have the claimed light transmittance. Accompanying this Response is a Declaration Under 37 CFR 1.132 showing that annealing does not improve light transmittance of a crystal produced by the method of JP '197.

As detailed on the record previously, the process of JP '197 is different from the present invention and, therefore, does not inherently produce the same product.

Despite the differences in the methods of JP '197 (no barrier between heater and crucible) and disclosed in the present application (barrier present), the Examiner asserts that the products are the same after annealing. However, the accompanying Declaration clearly shows that the two methods produce different products, regardless of annealing. Comparative Experiment II in the Declaration repeats the crystal pulling method of JP '197 (which lacks a barrier and a lid) and produces a crystal having light transmittance at 632.8 nm of 72.5%. After annealing, the light transmittance was still only 73.4%. The high surface roughness of the crystal produced according to JP '197 was essentially unchanged after annealing. Thus, not only does an "as-grown" crystal produced according to JP '197 not inherently possess the claimed light transmittance, such light transmittance is not achievable by annealing as asserted by the Examiner. Since the claimed crystal has properties not achievable by the prior art, claims 1-14 are not anticipated by JP '197.

In addition, JP '197 does not render the present invention obvious. Nothing in JP '197 indicates that the claimed light transmittance would be achievable, much less desirable. Applicants have demonstrated that even if crystals produced according to JP '197 were annealed, their surface quality and light transmittance would not improve. Therefore, claims 1-14 are non-obvious over JP '197.

(2) U.S. Patent Publication No. 2004/009205 to Li et al. and JP 2000-272,990.

The Office Action rejects claims 1, 3, 5 and 10 under §103(a) as being obvious over Li in view of the present specification's discussion of prior art and JP '990. The Examiner contends that when these teachings are combined, they would yield a product that is the same as the product of the present invention. However, the accompanying Declaration shows that a combination of these references does not produce the same product as the present invention.

Comparative Example I of the Declaration reports a crystal grown using the BS (crucible depression) method outlined in the prior art (including Li) in a crucible with smooth walls created by the use of carbon (as disclosed in JP '990) and with a further annealing process. The crystal of Comparative Experiment I exhibited a light transmittance of only 48.8% before annealing and 47.2% after annealing. The crystal produced using teachings of Li, JP '990 and the known BS method falls far short of the claimed crystal's minimum of 80% transmittance at 632.8 nm. Accordingly, the claimed invention constitutes a unique product, which is not obvious in light of the combined prior art.

(3) U.S. Patent No. 6,332,922 to Sakuma et al. and U.S. Patent No. 6,673,150 to Garibin et al.

The Examiner rejects claims 1, 4, 5, and 11 under 35 U.S.C. §103(a) as being obvious over Sakuma or Garibin in view of the present specification's discussion of prior art and JP '990. The Examiner contends that Garibin or Sakuma disclose a crystal which, after annealing and combined with the teachings of JP '990 would constitute the same or similar product as the present invention. However, the products produced by these processes are not the same as the current invention. Comparative Experiment I of the accompanying Declaration clearly shows that a crystal produced by the BS method (per Garibin, Sakuma or Applicants' prior art discussion) in a carbon-lined crucible (per JP '990) with or without annealing cannot achieve the claimed light transmittance. The claimed crystal is not obtainable by practicing the combined teachings of the prior art. Therefore, claims 1, 4, 5 and 11 define thereover.

In addition, the Examiner's assertion that Sakuma discloses a single crystal of calcium fluoride with "superior optical property" is misplaced. All that Sakuma teaches is that double refraction (birefringence value) is improved by annealing. See col. 8, lines 28-33. It does not teach that annealing improves light transmittance. While double refraction from distortion in a crystal can be decreased by annealing, opacity is unchanged by annealing, as demonstrated in Comparative Examples I and II of the accompanying Declaration. Therefore, the statement in Sakuma regarding improvement of an optical property is not relevant to the present invention.

(4) Li and JP '990, JP '997.

The rejection of claims 1-14 under §103(a) as being obvious over Li, in view of Applicants' disclosure, JP '990 and JP '197 should also be withdrawn. The combination of these references and teachings could not result in the claimed invention. As demonstrated by the accompanying Declaration (Comparative Example I), a crystal produced via the BS method (per Li or Applicants' disclosure regarding prior art), made of a certain thickness (per JP '197) in a graphite-lined crucible (per JP '990), with or without annealing does not exhibit the claimed minimum 80% light transmittance at 632.8 nm. Therefore, these references do not render claims 1-14 obvious.

For the foregoing reasons, Applicants respectfully request reconsideration and allowance of claims 1-14.

Respectfully submitted,

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